



JOINT CANADA-UNITED STATES
NATIONAL STANDARD

ANSI/CAN/UL/ULC 6200:2019 (R2025)

STANDARD FOR SAFETY

Controllers for Use in Power Production

SCC FOREWORD

National Standard of Canada

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UL Standard for Safety for Controllers for Use in Power Production, ANSI/CAN/UL/ULC 6200

First Edition, Dated May 31, 2019

Summary of Topics

This reaffirmation of ANSI/CAN/UL/ULC 6200 dated May 9, 2025 is being issued to update the title page to reflect the latest ANSI and SCC approval dates as a Reaffirmed American National Standard (ANS) and National Standard of Canada (NSC). No changes in requirements are involved.

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The requirements are substantially in accordance with Proposal(s) on this subject dated February 14, 2025.

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MAY 31, 2019

(Title Page Reprinted: May 9, 2025)

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ANSI/CAN/UL/ULC 6200:2019 (R2025)

Standard for Controllers for Use in Power Production

First Edition

May 31, 2019

This ANSI/CAN/UL/ULC Safety Standard consists of the First Edition including revisions through May 9, 2025.

The most recent designation of ANSI/UL 6200 as a Reaffirmed American National Standard (ANS) occurred on May 9, 2025. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This standard has been reaffirmed as a National Standard of Canada (NSC) on May 9, 2025.

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Preface

This is the First Edition of the ANSI/CAN/UL/ULC 6200, Standard for Controllers for Use in Power Production.

UL is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO). ULC Standards is accredited by the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization.

This ANSI/CAN/UL/ULC 6200 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

Annex [A](#), identified as Normative, forms a mandatory part of this Standard.

Annex [B](#), identified as Informative, is for information purposes only.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a “yes” or “no” answer based on the literal text of the requirement concerned.

Comments or proposals for revisions on any part of the Standard may be submitted at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

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This Edition of the Standard has been formally approved by the Technical Committee (TC) on Controls for Stationary Engine Driven Assemblies, TC 6200.

This list represents the TC 6200 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

TC 6200 Membership

Name	Representing	Interest Category	Region
Basler, Michael	Basler Electric Co.	Producer	USA
Belcher, Steven	FM Generator INC.	Supply Chain	USA
Bonn, Dale	Travelers Insurance	General Interest	USA

TC 6200 Membership Continued on Next Page

TC 6200 Membership Continued

Name	Representing	Interest Category	Region
Bush, Ken	Maryland State Fire Marshal's Office	Authorities Having Jurisdiction	USA
Call, Dan	Winco INC	Supply Chain	USA
Chase, Kasey	ComAp	Producer	USA
Ching, Yonghan	Cummins Power Generation Inc	Producer	USA
Day, Rick	State of Michigan Fire Marshal Office	Authorities Having Jurisdiction	USA
Dollard, James	IBEW Local 98	General Interest	USA
Dona, Mario	Mario Dona & Associates	General Interest	Australia
Eifrid, Brady	Discovery Energy LLC	Producer	USA
Evans, Timothy	UL Solutions	Testing & Standards Org.	USA
Flyvholm, Jesper	DEIF A/S	Producer	Europe
Jonas, Jeff	Generac Power Systems Inc.	Producer	USA
Lozano, Javier	Intertek Testing Services	Testing & Standards Org.	USA
Martin, Derrick	UL Standards & Engagement	TC Project Manager (Non-Voting)	USA
Niclaus, Mike	NEC Power LLC	Commercial / Industrial User	USA
Sahota, Santokh	Simson Maxwell Ltd.	Producer	Canada
Sappington, Steven	Caterpillar Inc.	Producer	USA
Sinnott, Aimee	UL Standards & Engagement	TC Chair (Non-Voting)	USA
Sudler III, Samuel	SEA LTD	General Interest	USA
Watt, Glen	Glenergy Services	Authorities Having Jurisdiction	Australia
Young, Eddie	IRET Thermal Group Ltd	General Interest	Canada

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This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE.

INTRODUCTION

1 Scope

1.1 These requirements apply to control panels, control units, and other various electrical circuits employed within a control circuit device intended for support functions, maintain operation and limiting safety control features for use in a Stationary Engine Driven Assembly or similar power production equipment control applications.

1.2 These requirements cover controls operating at 600 Volts a.c. or d.c maximum with sensing and measurement circuits without the use of isolation devices and 36 kV a.c. or d.c. maximum with the use of isolation devices.

1.3 These requirements apply only to electrically operated control equipment.

1.4 These requirements apply to equipment intended to be operated and installed by qualified personnel in the field.

1.5 These requirements apply to control equipment used in or with movable engine driven assemblies that are otherwise constructed the same as stationary engine driven assemblies.

1.6 These requirements do not cover:

a) Distribution equipment which sole function is the automatic or nonautomatic transferring of one or more load conductor connections from one power source to another. In Canada the Standard for Transfer Switch Equipment is CSA C22.2 No. 178.1. In the United States it is the Standard for Transfer Switch Equipment, UL 1008.

b) Devices in the output power circuit, but would apply to pilot devices that monitor or control switching devices that control loads in power circuits.

c) Controls for the propulsion engine of a vehicle.

d) Independent equipment that does not perform any control function of an engine driven assembly or similar power production equipment control applications.

e) Equipment or devices for use in or connected to hazardous (Classified) locations.

f) Industrial Control Equipment for general use. In Canada the Standard for Industrial Control Equipment is CSA C22.2 No. 14. In the United States it is the Standard for Industrial Control Equipment, UL 508.

g) General Use Industrial Control Panels and Industrial Control Panel Assemblies other than power production. In Canada the Standard for Industrial Control Panels and Assemblies is CSA C22.2 No. 286. In the United States it is the Standard for Industrial Control Panels, UL 508A.

h) Equipment or devices for use in mobile applications.

2 General

2.1 Units of measurement

2.1.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.2 Verification

2.2.1 Labels and literature intended to accompany a product, such as installation, rating, operation, and user-maintenance instructions or manuals shall be reviewed in the investigation of the product.

2.3 Environmental conditions

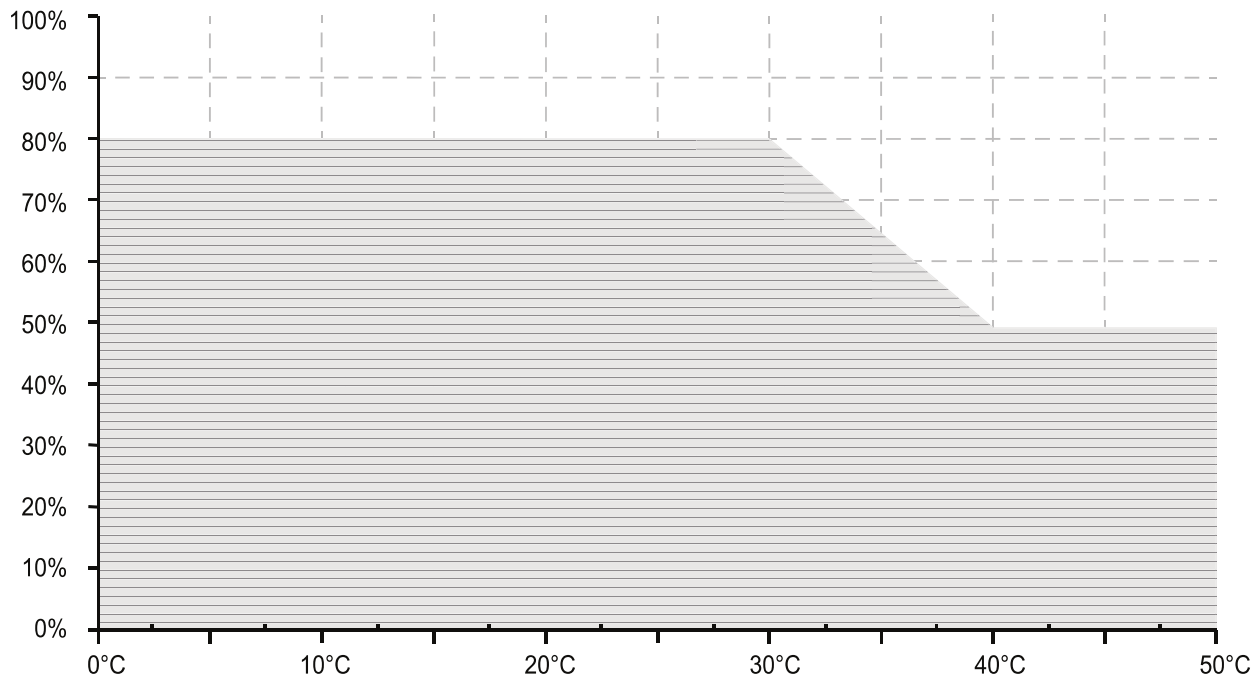
2.3.1 This standard applies to equipment designed for use under the following conditions:

- a) Indoor or outdoor use;
- b) Altitude 0 to 2000 m;
- c) Ambient temperature as declared by manufacturer or per [Table 2.1](#);
- d) Maximum relative humidity in that does not exceed the levels charted in [Figure 2.1](#);
- e) Voltage fluctuation of 90 percent to 110 percent of the nominal rated voltage for utility/mains connected equipment and 75 percent to 120 percent of the nominal rated voltage for battery connected circuits;
- f) Overvoltage Level III as defined in Insulation Coordination, CSA C22.2 No. 0.2 for Canada and Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840 for the United States based on direct connection to distribution circuits and local to the generator assembly; and
- g) Pollution degree 3 as defined in Insulation Coordination, CSA C22.2 No. 0.2 for Canada and Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840 for the United States.
- h) Altitudes greater than 2000 m. See Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests, IEC 60664-1 Table A.2.

Table 2.1
Ambient temperatures

	Minimum		Maximum			
	Enclosed/open equipment		Enclosed equipment		Open equipment	
	°C	°F	°C	°F	°C	°F
Indoor	0	(32)	40	(104)	55	(131)
Outdoor	minus 35	(minus 31)	55	(131)	70	(158)

Figure 2.1
Maximum relative humidity



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2.4 Components

2.4.1 Except as indicated in [2.4.2](#), a component of a product covered by this Standard shall comply with the requirements for that component. See Annex A for a list of Standards covering components generally used in the products covered by this Standard. A component shall comply with the Standards of UL or ULC or CAN/CSA Standards as appropriate for the country where the product is to be used.

Exception: PCB mounted components, such as resistors, capacitors, surface mounted inductors, semiconductor switches, and microprocessors are not evaluated as components but as an assembly feature of a PCB.

2.4.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

2.4.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.4.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

2.4.5 If the manufacturer assigns a rating or an intended use to a component of a device (for example, an integral auxiliary switch intended to control an external circuit) the component is to be evaluated for that rating or use or both.

3 Glossary

3.1 General

3.1.1 AMBIENT TEMPERATURE – The temperature of the air medium into which the heat of the equipment is dissipated. See [Table 2.1](#) for standard ambient temperature conditions.

3.1.2 CONTROL CIRCUIT – A circuit that carries the electric signals directing the performance of a device, but which does not carry the main power. A control circuit is generally limited to 15 amperes.

3.1.3 CONTROL SYSTEM – An assembly of two or more engine and/or generators control circuit components such as engine control modules, paralleling modules, fuel control modules, and voltage regulators in combination with push-button, pilot lights, selector switches, timers, switches, and/or control relays. Generator Control Systems may be provided with a complete enclosure, partial enclosure for flat surface panel mounting, or open type for mounting totally within an ultimate enclosure such as the engine generator assembly enclosure.

3.1.4 CONTROLLER – A device or group of devices that serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.

3.1.5 ENGINE DRIVEN ASSEMBLY – Includes the engine and any machine designed to convert energy; thermal energy, rotating mechanical work, electrical power generation.

3.1.6 LARGE SCALE AUTOMATIC VOLTAGE REGULATOR (AVR) – Cabinet enclosed network of control equipment with multiple circuit boards and field excitation current greater than 75 A.

3.1.7 LOAD DEVICE – The solenoid, relay, contactor, circuit breaker, motor, heater, or other device controlled by the output circuit of a controller.

3.1.8 MECHANICAL GUARD – A part or barrier that reduces the risk of access to a component or prevents the splashing, dripping or spraying of coolant, oil or fuel that has the potential of causing an electrical, fire hazard or injury to persons.

3.1.9 MOBILE – An engine driven assembly intended to produce power while in motion.

3.1.10 MOVABLE – An engine driven assembly other than stationary or mobile installations intended to produce power while it is not in motion.

3.1.11 PILOT DEVICE – An auxiliary mechanism that actuates, energizes, governs, or regulates another mechanism.

3.1.12 PILOT DUTY – The rating assigned to the output of a Pilot Device or similar circuit to control the energizing of the coil of a relay, contactor, solenoid, or similar coil operated mechanism.

3.1.13 PILOT LIGHT – A lamp that indicates when a pilot device is operating.

3.1.14 SNUBBER CIRCUIT – A device or circuit used to suppress (“snub”) voltage transients in electrical systems. Snubber circuits are frequently used in electrical systems with an inductive load where the sudden interruption of current flow often leads to a sharp rise in voltage across the device creating the

interruption. This sharp rise in voltage is a transient and can damage and lead to failure of the controlling device. A spark is likely to be generated (arcing), which can cause electrical breakdown of a switching device or electromagnetic interference in other circuits. The snubber prevents this undesired voltage by conducting transient current around the device.

3.1.15 SOLID-STATE RELAY/SWITCHING DEVICES – Electrical relay/switching devices in which the intended response is produced by electronic, magnetic, optical or other components without mechanical motion.

3.1.16 STATIONARY – An engine driven assembly that is intended to be hard-wired and/or permanently installed.

3.1.17 SURROUNDING AIR TEMPERATURE RATING – A rating assigned to open type equipment that refers to the maximum ambient temperature of air immediately surrounding the equipment inside of the ultimate enclosure.

3.1.18 UTILITY-INTERACTIVE DEVICE – An individual or multiple devices (example: programmable control) used in an interconnection system intended for use in parallel with an electric utility to supply common loads and sometimes deliver power to the utility.

3.1.19 WET LOCATION – Location where occasional or continuous exposure to water or other liquids is anticipated. Circuits, including wiring and connections, exposed to outdoor environments or spraying, splashing, or dripping water, oil, or coolant (such as within the engine compartment) are considered to be in wet locations.

3.2 Personnel

3.2.1 OPERATOR – Trained Personnel responsible for day to day operation of the system.

3.2.2 QUALIFIED – Having undergone formal instruction and/or educational program related to the specified tasks.

3.3 Enclosures

3.3.1 ASSEMBLY ENCLOSURE – The enclosure provided and evaluated with the end product assembly that houses the generator, prime mover, and associated electrical equipment. Engine and generator controls may be housed in the engine or generator assembly enclosure or in a separate attached or remote enclosure.

3.3.2 ENCLOSED EQUIPMENT – Equipment provided with complete enclosures and marked with one or more specific Enclosure Type ratings.

3.3.3 ENCLOSURE – The portion of a unit that:

- a) Reduces the accessibility of a part that involves a risk of fire, electric shock or injury to persons, or
- b) Reduces the risk of propagation of flame, sparks, and molten metal initiated by an electrical disturbance occurring within.

3.3.4 ENCLOSURE TYPE RATINGS – Enclosed control equipment identified with an enclosure type designation and is intended for use as indicated in:

- a) Table 110.28 of the National Electrical Code (NEC), NFPA 70 for the United States and

b) Table 65 of the Canadian Electrical Code, CSA C22.1 for Canada.

3.3.5 OPEN-TYPE – Unless otherwise specified in the instructions or markings on the product, open-type equipment is intended for installation completely within enclosures supplied in the field.

3.3.6 PANEL MOUNT – Equipment with partial or incomplete enclosures intended for mounting through the exterior wall in an opening provided in an enclosure.

3.3.7 WEATHER ENCLOSURE – An Assembly Enclosure that is intended to protect from exposure to environmental conditions of an outdoor application. Weather Enclosures are normally rated “rainproof”, which is equivalent to the ingress protection provided by the Enclosure Type rating of 3R, and “raintight”, which is the same as rainproof excepted no entrance of water is allowed under the rain test.

3.4 Power sources

3.4.1 OVERVOLTAGE – Any voltage that exceeds its rated or intended value. A continuous overvoltage condition on generator system that is connected in parallel with other power sources can cause reverse reactive power to other sources.

3.5 Insulation coordination

3.5.1 CLEARANCES– Through-air spacing – The shortest distance measured through air between conductive parts.

3.5.2 CREEPAGE DISTANCES (CREEPAGE) – Over-surface spacings – The shortest distance measured over the surface of insulation between conductive parts.

3.5.3 ELECTRICAL INSULATION – That part of an electrotechnical product that separates the conducting parts at different electrical potentials.

3.5.4 SPACINGS – Any combination of clearance distances, creepage distances, and distances through insulation.

3.6 Wiring methods

3.6.1 FACTORY WIRING – The connection of a wire in the end application under controlled condition.

3.6.2 FIELD WIRING – The connection of a wire, which is made in the field and that is subjected to the requirements for a terminal for field wiring as specified in this standard and:

- a) The National Electrical Code (NEC), NFPA 70 for the United States and
- b) The Canadian Electrical Code, CSA C22.1 for Canada.

3.7 Ground

3.7.1 GROUND – The earth, unless otherwise specified.

3.7.2 GROUNDED CONDUCTOR – A system or circuit conductor intentionally connected to ground at the building supply source, also referred to as “common” or “neutral.”

3.7.3 GROUNDING – The act of establishing a conductive connection, whether intentional or otherwise, between an electrical circuit or electrical equipment and earth.

3.7.4 GROUNDING CONDUCTOR, EQUIPMENT (EGC) – In the United States, the definition is in Article 100 of the National Electrical Code (NEC), NFPA 70. In Canada, the definition for Bonding Conductor is in Section 0 of the Canadian Electrical Code, CSA C22.1.

3.8 Circuits – general

3.8.1 ACCESSIBLE CIRCUIT – A circuit that is subject to inadvertent user contact or does not meet electrical spacing requirements to exposed conductive parts.

3.8.2 ACCESSIBLE NON-HAZARDOUS SECONDARY CIRCUIT – An Accessible Circuit that meets the requirements of Non-Hazardous Secondary Circuit to the extent that directly touching any Live Part has no risk of rendering an electric shock, electric burn under both open or short circuit conditions and there is no risk of fire when a direct short is applied across the circuit or to conductive and/or grounded parts.

3.8.3 DEAD METAL – A conductive part that has Galvanic Isolation to Live Parts, Grounded Parts, and accessible conductive parts.

3.8.4 HAZARDOUS LIVE – A circuit capable of rendering an electric shock or electric burn in normal condition or single-fault condition.

3.8.5 HAZARDOUS VOLTAGE – A Hazardous Live circuit exceeding the following available electrical parameters under normal condition or single-fault condition:

- a) (30 V rms) 42.4 V peak for sinusoidal or non-sinusoidal AC;
- b) 60 V for continuous DC, or 60 V peak for interrupted DC outside the range of 10 – 200 Hz;
- c) 5 A; or
- d) 100 VA.

3.8.6 ISOLATED CIRCUIT – A circuit having an isolation transformer or isolating components such as optically or magnetically coupled devices.

3.8.7 LIVE PART – Denotes metal or conductive parts that, during intended use, have a potential difference with respect to ground or any other conductive part.

3.8.8 NON-HAZARDOUS SECONDARY CIRCUIT – A circuit that is not capable of rendering an electric shock, electric burn, or fire in normal condition and single-fault condition.

3.8.9 OPPOSITE POLARITY – The relationship between two Live Parts such that an interconnection between them allows a flow of current which is limited by the impedance of the electrical supply circuit.

3.8.10 PRIMARY CIRCUIT – Circuit that is directly connected to the external supply mains or other equivalent source (such as a motor-generator set) that supplies the electric power. It includes the primary windings of transformers, motors, other loading devices, and the means of connection to supply mains.

3.8.11 SECONDARY CIRCUITS – Those circuits supplied from transformer secondary windings or the output of a power supply that are electrically separated from the primary windings or input to a power supply.

3.8.12 SUPPLY MAINS – Permanently installed power source which may also be used to supply electrical apparatus that is outside the scope of this standard.

3.9 Generators

3.9.1 AUTOMATIC VOLTAGE REGULATOR (AVR) – An excitation controller that is provided with voltage feedback from the output of a generator output and directly controls the field coil current.

3.9.2 EXCITATION – The process of generating a magnetic field on the field coils of an alternator by means of an electric current.

3.9.3 EXCITATION CONTROLLER – Controls the output voltage of a generator by controlling its excitation (field) current.

3.9.4 FIELD COIL – The magnetic field component of an alternator, generator, dynamo, motor, or rotary converter. The phrase is also often used in the plural form, as field coils. The field coils can be mounted on either the rotor or the stator, depending on whichever method is the most cost-effective for the device design.

3.9.5 FIELD CURRENT REGULATOR (FCR) – A controller that maintains a constant field current independent of the generator output voltage.

3.9.6 GENERATOR – A machine by which mechanical energy is changed into electrical energy usually by electromagnetic induction. Generators are often referred to as DC machines while alternators are AC machines. In the context of this document, the term generators shall be understood to apply to both AC and DC machines.

3.10 Equipment – general

3.10.1 INTERNAL POWER TRANSFER – A circuit allowing more than one source to power an internal circuit but only one source is connected at a time. See also Transfer Switch.

3.10.2 POWER CIRCUIT – Conductors and components of branch and feeder circuits.

3.10.3 SAFETY CIRCUIT – A primary or secondary circuit that is relied upon to reduce the risk of fire, electric shock, injury to persons, operation of controlled equipment that is capable of resulting in a risk of fire, electric shock, or injury to persons. Examples include an interlock circuit, a circuit which limits leakage current to accessible parts, a circuit which limits the wattage to a limited-energy circuit, or a phase control or other circuit designed to limit temperatures or fault current in the end-use product to acceptable levels.

Note: Functional safety ([3.18.1](#)) applies to safety circuits.

3.10.4 SURGE PROTECTIVE DEVICE – A component or assembly that limits the transient voltage such as an overvoltage protective device, a transformer with isolated windings, or damping impedance suitably located.

3.10.5 TERMINAL VOLTAGE – The potential difference measured across the output phase terminals of the generator under an open circuit condition.

3.10.6 TRANSFER SWITCH – A switching device that disconnects a load from a primary source and connects the load to another source. Automatic Transfer Switches operate without human intervention when power is lost in the primary source.

3.10.7 TRANSFER SWITCH CONTROLLER – A device that remotely causes an Automatic Transfer Switch to operate.

3.11 Engine controls

3.11.1 ENGINE – A machine for converting energy (in such forms as heat, chemical energy, radiation energy, and potential energy) into mechanical force and motion.

3.11.2 ENGINE CONTROLLER – Device, such as governor device and engine control unit that control the operation of the prime mover. Engine controls for external and internal combustion engines control the engine starting motor, air flow, and fuel flow.

3.11.3 ENGINE STARTING SEQUENCE – The sequence of Starting Cycles repeated until the number of Start Attempts Limit is reached or the engine has started. Also includes the sequence of continuously starting the engine until the Start Attempt Limit time is reached or the engine has started.

3.11.4 INTERNAL AND EXTERNAL COMBUSTION ENGINE – Any heat driven engine in which the working medium consists of the products of combustion of the air and fuel supplied. This combustion usually is affected within the working cylinder but can take place in an external chamber. Typical examples of internal combustion engines are Otto cycle, Diesel cycle, and Brayton cycle (gas turbine engines). Typical examples of external combustion engines are steam or similar design engine.

3.11.5 PRIME MOVER – The engine or rotating equipment driving the generator, pump, or other mechanical load. Typical examples of prime movers are, internal combustion and external combustion engines, wind and water driven turbines, and electric motors.

3.11.6 STARTER CONTACTOR – A high current battery contactor used to energize the Starter Solenoid. Typical starter contactor coil power is 8 to 25 watts.

3.11.7 STARTER SOLENOID – A dual function, two coil operated device used to mechanically engage the starter motor to the engine and to energize the windings of the starter motor.

3.11.8 STARTING – The energizing of an electric (or hydraulic, or pneumatic) starter motor (or starter) for rotating an engine so as to initiate the engine's operation under its own power. The starting operation in engine driven assemblies is usually initiated by manually actuating a momentary switch or automatically energizing a relay coil that controls the operation of the starter contactor or solenoid valve.

3.11.9 STARTING (DUTY) CYCLE – The part of the engine starting sequence that consists of single iteration of start time plus the rest time.

3.11.10 STARTING TIME LIMIT (CRANK/CYCLE LIMIT) – The maximum time that the engine starting sequence is allowed to operate without the engine starting. A failure to start is indicated after the start limit has been reached.

3.12 Annunciators

3.12.1 ANNUNCIATOR – An audio or visual indicator that announces which electrical circuit has become active. For the purposes of this standard the electrical circuits typically being monitored include engine sensors, engine starting battery, transfer switch, air damper control, and/or generator output. The visual indicators range from pilot lights and panel meters to panel mounted displays.

3.13 Cogeneration controls

3.13.1 Reserved.

3.14 Parallel generation systems

3.14.1 SYNCHRONIZATION – The matching of the voltage amplitude, phase angle, and frequency of the output of a generator with the amplitude, phase angle, and frequency of the local area system bus or utility.

3.15 Protective controls

3.15.1 CURRENT LIMITING – Equipment designed to limit the current to a predetermined value.

3.15.2 ELECTRONIC PROTECTION – Equipment that provide various types of electronic protection by detecting abnormal conditions and isolating them from the rest of the electrical system. For the purpose of this document, this term may apply to equipment that causes the circuit breaker to open, disconnect to open, engine to shut down, or generator to stop production of power.

3.15.3 GROUND FAULT – Denotes an unintentional electrical path between a part operating normally at some potential to ground, and ground. Ground fault protection of a generator is intended to interrupt equipment damaging line-to-ground currents. Ground fault protection of personnel is intended to interrupt excessive leakage currents to protect from risk of electric shock. Ground fault protection will operate at current levels lower than current levels required to protect from overload or short circuit conditions.

3.15.4 INTERRUPTING DEVICE – A device capable of being opened and reclosed whose purpose is to interrupt faults and restore service or disconnect loads. These devices can be manual, automatic, or motor-operated. Examples include circuit breakers, motor-operated switches, and electronic switches.

3.15.5 MOTORING – The rotation of a generator from reverse electrical power instead from the prime mover.

3.15.6 OVERCURRENT – Any current in excess of the rated current of the equipment, generator, or ampacity of the conductors. It may result from overloads, short circuits, and faults to ground.

3.15.7 OVER EXCITATION – A condition when the excitation system is providing too much field current and as a result, the rotor of the generator will over heat.

3.15.8 OVERLOAD – In the United States, the definition is in Article 100 of the National Electrical Code (NEC), NFPA 70. In Canada, the definition is in Section 0 of the Canadian Electrical Code, CSA C22.1.

3.15.9 REVERSE POWER – Electrical power provided to the generator from the electric power system or load that causes motoring of the generator after loss or reduction of rotational power from the prime mover.

3.15.10 SHORT CIRCUIT – A fault current is caused by direct line-to-line short across a load or the generator terminals. The symmetrical short circuit fault current is a function of the terminal voltage divided by the sum of transformer or generator impedance, line-side series equipment impedance, and the conductor impedance at the location of the fault.

3.15.11 TYPE 1 ACTION – Automatic action of an operating control for which the manufacturing deviation and the drift of its operating value, operating time or operating sequence have not been declared and evaluated.

3.15.12 UNDER EXCITATION – A condition where the generator is not getting enough excitation current. If the generator does not get enough excitation current, it can be un-synchronized with the grid. This is referred to as slipping a pole. If this occurs, the generator can be severely damaged.

3.16 Current sensing

3.16.1 CURRENT TRANSFORMER – A type of instrument transformer used to measure AC current. It is intended to be able to measure the current through an isolated secondary winding where the ratio of primary turns to secondary turns is inversely proportional to the ratio of the primary current to the secondary current up to the knee-point.

3.16.2 KNEE-POINT – The point that indicates saturation of the current transformer. The knee-point voltage of a current transformer is the magnitude of the secondary voltage after which the output current ceases to follow linearly the input current. This means that the one-to-one or proportional relationship between the input and output is no longer within declared accuracy.

3.16.3 PASS-THROUGH TYPE CURRENT TRANSFORMER – A bushing or window type current transformer in which the primary conductor is passed through an opening in the core of the transformer and the secondary windings. The pass-through type CT is not provided with primary terminals. The secondary may be provided with terminals or leads.

3.17 Fire detection and alarm systems

3.17.1 FIRE DETECTION AND ALARM SYSTEMS – A system that includes smoke flame detectors intended to activate an alarm when a fire is detected.

3.18 Functional safety

3.18.1 FUNCTIONAL SAFETY – Safety of a Stationary Engine Driven Assembly or similar Power Production equipment, which depends on the correct operation of control functions, which in turn depends on the integrity of the control circuits implementing these control functions. Such control circuits are identified as Safety Circuits ([3.10.3](#) and Safety Circuits, Section [37](#)).

3.18.2 PROGRAMMABLE ELECTRONIC SAFETY-RELATED SYSTEMS – Safety Circuits that include, and rely on programmable electronics and software.

3.18.3 SUPPLEMENTARY FUNCTION – A function is considered supplementary when the primary protection or control is provided by a separate device evaluated for the application.

3.19 Test

3.19.1 PERFORMANCE DESIGN TEST – Test of one or more devices made to a certain design to demonstrate that the design meets certain specifications. Also referred to as Type Test.

3.19.2 PRODUCTION-LINE TEST – A test conducted on every unit of equipment prior to shipment. Also referred to as Routine Test.

4 Reference Publications

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

4.2 Throughout this Standard, the CSA and ULC standard references apply to products intended for use in Canada, while the UL standard references apply to products intended for use in the United States. Combined references are commonly separated by a slash (“ / ”).

4.3 The following publications are referenced in this Standard:

Canada	United States
CSA C22.2 No. 107.3, Uninterruptible Power Systems	UL 1778, Uninterruptible Power Systems
CSA C22.2 No. 66-1, Low Voltage Transformers – Part 1: General Requirements	UL 5085-1, Low Voltage Transformers – Part 1: General Requirements
CSA C22.2 No. 66.3, Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers	UL 5085-3, Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers
CSA C22.2 No. 61010-2-030, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-030: Particular Requirements for Testing and Measuring Circuits	UL 61010-2-030, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2-030: Particular Requirements for Testing and Measuring Circuits
CSA C22.2 No. 94.1, Enclosures for Electrical Equipment, Non-Environmental Considerations	UL 50, Enclosures for Electrical Equipment, Non-Environmental Considerations
CSA C22.2 No. 0.17, Evaluation of Properties of Polymeric Materials	UL 746C, Polymeric Materials – Use in Electrical Equipment Evaluations
No equivalent	UL 94, Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
No equivalent	UL 723, Test for Surface Burning Characteristics of Building Materials
CSA C22.2 No. 18.1, Metallic Outlet Boxes	UL 514A, Metallic Outlet Boxes
CSA C22.2 No. 18.3, Conduit, Tubing, and Cable Fittings	UL 514B, Conduit, Tubing, and Cable Fittings
No equivalent	UL 1439, Tests for Sharpness of Edges on Equipment
CSA C22.2 No. 178.1, Transfer Switch Equipment	UL 1008, Transfer Switch Equipment
CSA C22.2 No. 111, General-Use Snap Switches	UL 20, General-Use Snap Switches
CSA C22.2 No. 14, Industrial Control Equipment	UL 508, Industrial Control Equipment
CSA C22.2 No. 100, Motors and Generators	UL 1004-4, Electric Generators
CSA C22.2 No. 0.19, Requirements for Service Entrance Equipment	UL 869A, Reference Standard for Service Equipment
CSA C22.2 No. 18.2, Nonmetallic Outlet Boxes	UL 514C, Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
No equivalent	UL 746A, Polymeric Materials – Short Term Property Evaluations
CSA C22.2 No. 75, Thermoplastic-Insulated Wires and Cables	UL 83, Thermoplastic-Insulated Wires and Cables
CSA C22.2 No. 153, Electrical Quick-Connect Terminals	UL 310, Electrical Quick-Connect Terminals
CSA C22.2 No. 198.1, Extruded Insulating Tubing	UL 224, Extruded Insulating Tubing
CSA C22.2 No. 197, PVC Insulating Tape	UL 510, Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
CSA Component Acceptance Service Notice No. 5, Component Acceptance Service for Optocouplers and Related Devices	UL 1577, Optical Isolators
CSA C22.2 No. 66.1, Low Voltage Transformers – Part 1: General Requirements	UL 5085-1, Low Voltage Transformers – Part 1: General Requirements
CSA C22.2 No. 66-2, Low Voltage Transformers – Part 2: General Purpose Transformers	UL 506, Specialty Transformers
CSA C22.2 No. 66-3, Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers	
CSA C22.2 No. 47, Air-Cooled Transformers (Dry Type)	UL 1561, Dry-Type General Purpose and Power Transformers
CSA C22.2 No. 5, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures	UL 489, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
ULC-S111, Standard Method of Fire Tests for Air Filter Units	UL 900, Air Filter Units
CSA C22.2 No. 0.17, Evaluation of Properties of Polymeric Materials	UL 796, Printed-Wiring Boards
No equivalent	UL 1446, Systems of Insulating Materials – General
No equivalent	UL 746B, Polymeric Materials – Long Term Property Evaluations

